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(72) Inventors:
• **Fransen, Renatus Ignatius Josephus**
3135 ZD Vlaardingen (NL)
• **van den Berg, Karel**
2971 BR Bleskensgraaf (NL)
• **van der Lely, Alexander**
3065 NA Rotterdam (NL)

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(71) Applicant: **Lely Enterprises AG**
6300 ZUG (CH)

(74) Representative: **Corten, Maurice Jean F.M. et al**
Octroolbureau Van der Lely N.V.
Weverskade 10
3155 PD Maasland (NL)

(54) A Construction for automatically milking animals

(57) A construction for automatically milking animals is provided with a milk reservoir (3; 13), with milk lines and with a milking robot (5) having at least one teat cup (6; 20) and means (9, 10; 19) for connecting the teat cup(s) (6, 20) to the teats of an animal (1; 11) to be milked. The construction (2; 12; 25, 26) is designed so as to be displaceable as a whole. The construction (2; 12; 25, 26) is further provided with own propulsion means (7; 23, 24), which results in a wide range of application possibilities and a high degree of flexibility in use.

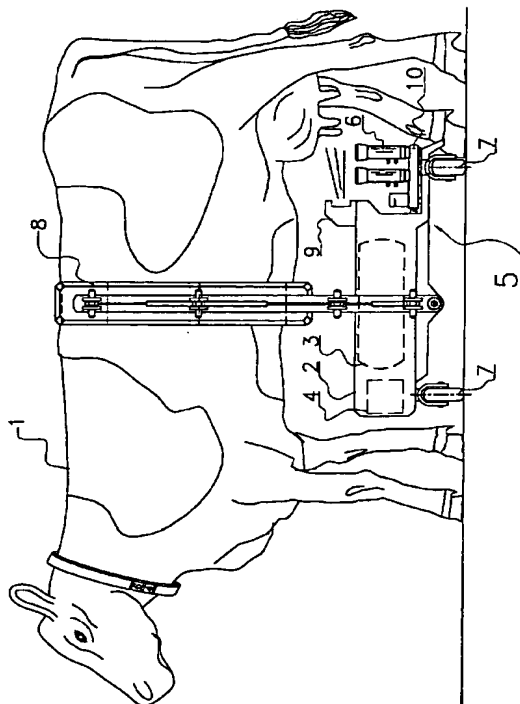


FIG. 1

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Description

[0001] The invention relates to a construction for automatically milking animals according to the preamble of claim 1.

[0002] Such a construction is known. The known constructions are positioned, for example by means of a tractor, at a certain place, where they are put into operation.

[0003] The invention aims at improving such a construction. According to the invention this is achieved by the measures mentioned in the characterizing part of claim 1. The own propulsion means result in a construction with a wide range of application possibilities and a high degree of flexibility in use.

[0004] The invention will now be explained in further detail with reference to the accompanying figures.

Figure 1 is a schematic side view of a cow with a first embodiment of the construction according to the invention;

Figure 2 is a schematic rear view of the cow with the construction shown in Figure 1;

Figure 3 is a schematic plan view of a further embodiment of the construction according to the invention;

Figure 4 is a schematic cross-section of the construction according to the arrows II in Figure 3, and Figure 5 is a schematic plan view of a further embodiment of the construction.

[0005] Figure 1 is a schematic side view of a cow 1 with a first embodiment of the construction according to the invention. In this embodiment the construction for automatically milking animals is designed as an unmanned vehicle 2 with a milk reservoir 3, a water tank 4, milk lines and a milking robot 5 (known per se) with (e.g. four) teat cups 6, with means for connecting the teat cups 6 to the teats of the animal 1 to be milked and with control equipment suitable therefor. The construction may further be provided with (non-shown) animal identification means known per se which are suitable for example for co-operating with identification means integrated in a collar of an animal 1 to be milked.

[0006] The vehicle 2 is provided with own propulsion means comprising drive means such as a motor and steering means such as swivelling wheels 7. Of course, the construction may also be provided with one swivelling wheel and/or a plurality of non-swivelling wheels, and/or be provided with rollers and/or caterpillar tracks and/or an air cushion construction. With the aid of the drive means and the steering means the construction is suitable for moving across the ground in a rolling and/or a hovering manner.

[0007] Preferably the propulsion means comprise navigation means which are suitable for determining a course to be followed for the construction and which are suitable for making the construction follow a certain

course with the aid of the propulsion means. The navigation means known per se may comprise a possibly remotely controllable computer with an input member and a map of the neighbourhood as well as GPS or DGPS. In this manner the unmanned vehicle 2 is accurately controllable.

[0008] In a preferred embodiment the construction is provided with means for locating a selected animal (said means being possibly suitable for co-operating with positioning means provided near, on or in the animal, such as transmitting and receiving equipment known per se or GPS or DGPS), and is suitable for approaching and possibly tracking the selected animal on the basis of data from the locating means. With the aid of the current position of the vehicle 2 and the current position of a selected animal 1 to be milked, a computer can determine a course to be followed and control the propulsion means in such a manner that the vehicle 2 follows the determined course. In this manner the animal 1 to be milked can automatically be found and approached by the vehicle 2.

[0009] The construction is provided with means for coupling at least a part of the construction, not being constituted by a teat cup 6, to an animal 1 to be milked. Said coupling means may comprise a pair of gripping arms 8, capable of being folded and unfolded or being slid in and out in a telescoping manner, which are able to grip the cow 1 on either side of her trunk when the vehicle 2 has reached a position under the cow 1 (see also Figure 2). In another, non-shown embodiment the gripping arm 8 may be suitable for gripping at least one leg of the animal 1. The construction is suitable for remaining connected with the animal 1 during a time interval after coupling, which time interval may be adjustable. The time interval may also depend on the duration of the milking process and/or the duration of the connection of the teat cups 6. The construction is further suitable for activating the means for connecting the teat cups 6 after coupling. The cow 1 can then be milked automatically. After milking the teat cups 6 are disconnected and the gripping arms 8 are folded or slid aside. Then the construction can continue its way to a following animal to be milked.

[0010] The means for connecting the teat cups 6 comprise for example a laser scanner 9 and a lifting device 10 for the teat cups 6 and/or a rotatable and/or shiftable and/or pivotable platform for the teat cups 6. The lifting device 10 may be suitable for connecting the teat cups 6 one by one or in pairs.

[0011] The construction is preferably provided with sensor means for registering movements and/or displacements of the animal 1 to be milked. It is for example possible for the construction to track the animal 1 to be milked before or during milking with the aid of data from the sensor means. When the construction as a whole is not too heavy, the means 8 for coupling may also be designed in such a manner that the construction is suspended as a whole from the animal 1 to be milked.

[0012] The construction may be provided with lure means for an animal 1 to be milked, with means for summoning an animal 1 to be milked (e.g. with the aid of a transmitter and a receiver), with repelling means for keeping animals that are not to be milked for the time being at a distance and/or with transmitting and/or receiving means for transmitting and/or receiving data to and/or from a receiving station collecting for example data regarding all milkings. The construction may further also be provided with transmitting and/or receiving means for transmitting and/or receiving data to and/or from an animal 1 to be milked. The latter means may be used for example for positioning purposes or for summoning an animal 1 to be milked.

[0013] By way of illustration Figure 2 shows schematically a rear view of the cow with the construction of Figure 1.

[0014] Figure 3 is a schematic plan view of a further embodiment of the construction according to the invention. By way of illustration Figure 4 shows schematically a cross-section of the construction according to the arrows II in Figure 3. In this embodiment the construction for automatically milking an animal 11 is designed as an unmanned vehicle 12 with a milk tank 13, a tank 14 for water and disinfectant, a tank 15 for water and foremilk, an entrance 16, an exit 17 and a feeding trough 18 that is capable of being pivoted aside and serves as a lure means and as a positioning means. The tanks 14 and 15 are designed as arc-shaped ones allowing the cow 11 to pass thereunder.

[0015] The construction is further provided with a milking robot (known per se) with a controllable robot arm 19 and (e.g. four) teat cups 20, with means for connecting the teat cups 20 to the teats of the animal 11 to be milked and with control equipment suitable therefor, such as a computer 21. The robot arm 19 may be moved for example along a rail 22 disposed in the upper part of the vehicle 12. The construction may further again be provided with (non-shown) animal identification means known per se which are suitable for example for co-operating with identification means that are integrated in a collar of an animal 11 to be milked.

[0016] The vehicle 12 is again provided with own propulsion means comprising drive means such as one or more motors 23 and steering means such as (swivelling) wheels 24. Further there may again be provided navigation means and/or means for locating animals to be milked. The vehicle 12 may automatically be positioned in the vicinity of a number of cows to be milked. The animals can then visit the construction in order to be milked. The vehicle 12 may also approach a selected animal and possibly follow it until said animal is prepared to be milked. For that purpose the vehicle 12 can assume the position shown in Figures 3 and 4.

[0017] Figure 5 shows schematically a plan view of a further embodiment of the construction. In this embodiment the construction comprises a first movable sub-construction 25 and a plurality of second sub-construc-

tions 26 that are movable relative to the first sub-construction 25. The first sub-construction 25 is an automatically movable master station with appropriate control equipment and a milk reservoir. Further there may again be provided navigation means and/or means for locating animals to be milked. The construction 25 has own propulsion means and can automatically be positioned in the vicinity of a group of animals to be milked.

[0018] The second sub-constructions 26 are automatically movable satellite stations and comprise the coupling means as well as the teat cup(s) and the means for connecting the teat cup(s). The constructions 26 may be connected with the construction 25 via milk lines. They have own propulsion means and may each be provided with navigation means and/or means for locating animals to be milked. Therefore, the constructions 26 can locate, approach and possibly track animals to be milked in the vicinity of the master station 25. When they have assumed the appropriate position relative to the animal to be milked, the animal can be milked automatically.

[0019] The construction 26 is preferably provided with sensor means for registering movements and/or displacements of the animal to be milked. For example, the construction 26 can track the animal to be milked before or during milking with the aid of data from the sensor means. The construction 26 may be designed both with and without means for gripping the animal to be milked. The constructions 26 may also be designed apart from the construction 25. In that case they deliver regularly or when required the milk yielded at the master station 25.

35 Claims

1. A construction for automatically milking animals, said construction (2; 12; 25, 26) being provided with a milk reservoir (3; 13), with milk lines and with a milking robot (5) having at least one teat cup (6; 20) and means (9, 10; 19) for connecting the teat cup (s) (6; 20) to the teats of an animal (1; 11) to be milked, said construction (2; 12; 25, 26) being designed so as to be displaceable as a whole, **characterized in that** the construction (2; 12; 25, 26) is further provided with own propulsion means (7; 23, 24).
2. A construction as claimed in claim 1, **characterized in that** the propulsion means (7; 23, 24) comprise drive means (23).
3. A construction as claimed in claim 1 or 2, **characterized in that** the propulsion means (7; 23, 24) comprise steering means (7; 24).
4. A construction as claimed in any one of claims 1 to 3, **characterized in that** the propulsion means (7;

- 23, 24) comprise navigation means.
5. A construction as claimed in claim 4, **characterized in that** the navigation means are suitable for determining a course to be followed by the construction (2; 12; 25, 26). 5
 6. A construction as claimed in claim 4 or 5, **characterized in that** the navigation means are suitable for making the construction (2; 12; 25, 26) follow a certain course with the aid of the propulsion means (7; 23, 24). 10
 7. A construction as claimed in any one of claims 1 to 6, **characterized in that** the construction (2; 12; 25, 26) is provided with means for locating an animal (1; 11). 15
 8. A construction as claimed in claim 7, **characterized in that** the means for locating are suitable for co-operating with positioning means provided near, on or in the animal (1; 11). 20
 9. A construction as claimed in claim 7 or 8, **characterized in that** the construction (2; 12; 25, 26) is suitable for approaching and possibly tracking the animal (1; 11) on the basis of data from the means for locating an animal. 25
 10. A construction as claimed in any one of claims 1 to 9, **characterized in that** the construction (2; 12; 25, 26) is provided with means (8) for coupling at least a part of the construction (2; 12; 25, 26), not being constituted by a teat cup (6; 20), to an animal (1; 11) to be milked. 30
 11. A construction as claimed in claim 10, **characterized in that** the means for coupling comprise at least one gripping arm (8). 35
 12. A construction as claimed in claim 11, **characterized in that** the gripping arm (8) is suitable for gripping the trunk and/or at least one leg of the animal (1; 11). 40
 13. A construction as claimed in any one of claims 10 to 12, **characterized in that** the construction (2; 12; 25, 26) is suitable for remaining connected with the animal (1; 11) during a time interval after coupling. 45
 14. A construction as claimed in claim 13, **characterized in that** the time interval is adjustable. 50
 15. A construction as claimed in claim 13 or 14, **characterized in that** the time interval depends on the duration of the milking process and/or the duration of the connection of the teat cup(s) (6; 20). 55
 16. A construction as claimed in any one of claims 10 to 15, **characterized in that** the construction (2; 12; 25, 26) is suitable for activating the means (9, 10; 19) for connecting the teat cup(s) (6, 20) after coupling.
 17. A construction as claimed in any one of claims 1 to 16, **characterized in that** the construction (2; 12; 25, 26) is provided with wheels (7; 24), rollers, caterpillar tracks and/or an air cushion construction as well as with steering means and is suitable for moving across the ground in a rolling and/or a hovering manner.
 18. A construction as claimed in any one of claims 1 to 17, **characterized in that** the construction (2; 12; 25, 26) is provided with a motor (23).
 19. A construction as claimed in any one of claims 1 to 18, **characterized in that** the construction (2; 12; 25, 26) is provided with lure means (18) for an animal (1; 11) to be milked.
 20. A construction as claimed in any one of claims 1 to 19, **characterized in that** the construction (2; 12; 25, 26) is provided with means for summoning an animal (1; 11) to be milked.
 21. A construction as claimed in any one of claims 1 to 20, **characterized in that** the construction (2; 12; 25, 26) is provided with repelling means for keeping animals that are not to be milked for the time being at a distance.
 22. A construction as claimed in any one of claims 1 to 21, **characterized in that** the construction (2; 12; 25, 26) is provided with transmitting and/or receiving means for transmitting and/or receiving data to and/or from a receiving station.
 23. A construction as claimed in any one of claims 1 to 22, **characterized in that** the construction (2; 12; 25, 26) is provided with transmitting and/or receiving means for transmitting and/or receiving data to and/or from an animal (1; 11) to be milked.
 24. A construction as claimed in any one of claims 1 to 23, **characterized in that** the construction (2; 12; 25, 26) comprises a first movable sub-construction (25) and at least one second sub-construction (26) which is movable relative to the first sub-construction (26).
 25. A construction as claimed in claim 24, **characterized in that** the first sub-construction (25) comprises a milk reservoir.
 26. A construction as claimed in claim 24 or 25, **char-**

acterized in that the second sub-construction (26) comprises the means for coupling as well as the teat cup(s) and the means for connecting the teat cup (s).

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27. A construction as claimed in any one of claims 1 to 26, **characterized in that** the construction (2; 12; 25, 26) is provided with sensor means for registering movements and/or displacements of the animal (1; 11) to be milked.

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28. A construction as claimed in claim 27, **characterized in that** the construction (2; 12; 25, 26) is suitable for tracking the animal (1; 11) to be milked with the aid of data from the sensor means.

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29. A construction as claimed in claims 24 and 27, **characterized in that** the second sub-construction (26) is suitable for tracking the animal (1; 11) to be milked with the aid of data from the sensor means.

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30. A construction as claimed in any one of claims 10 to 29, **characterized in that** the coupling means (8) are suitable for suspending the construction (2; 12) as a whole from the animal (1; 11) to be milked.

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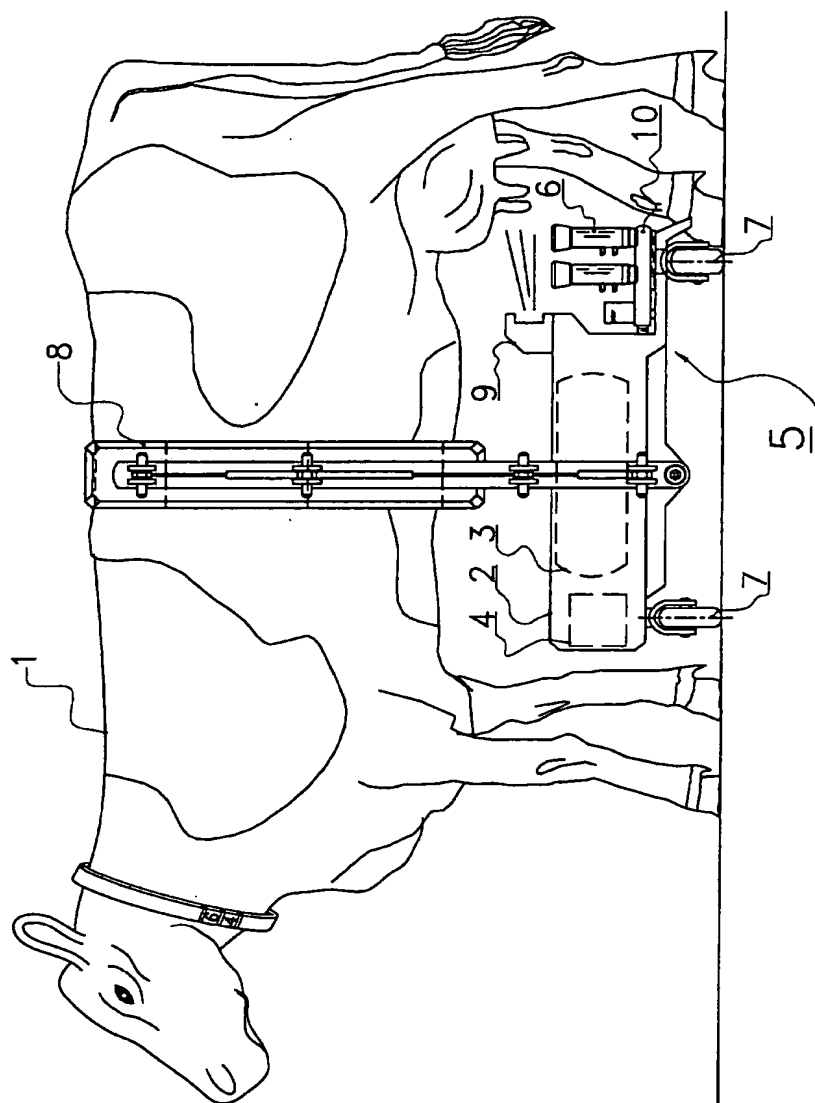


FIG. 1

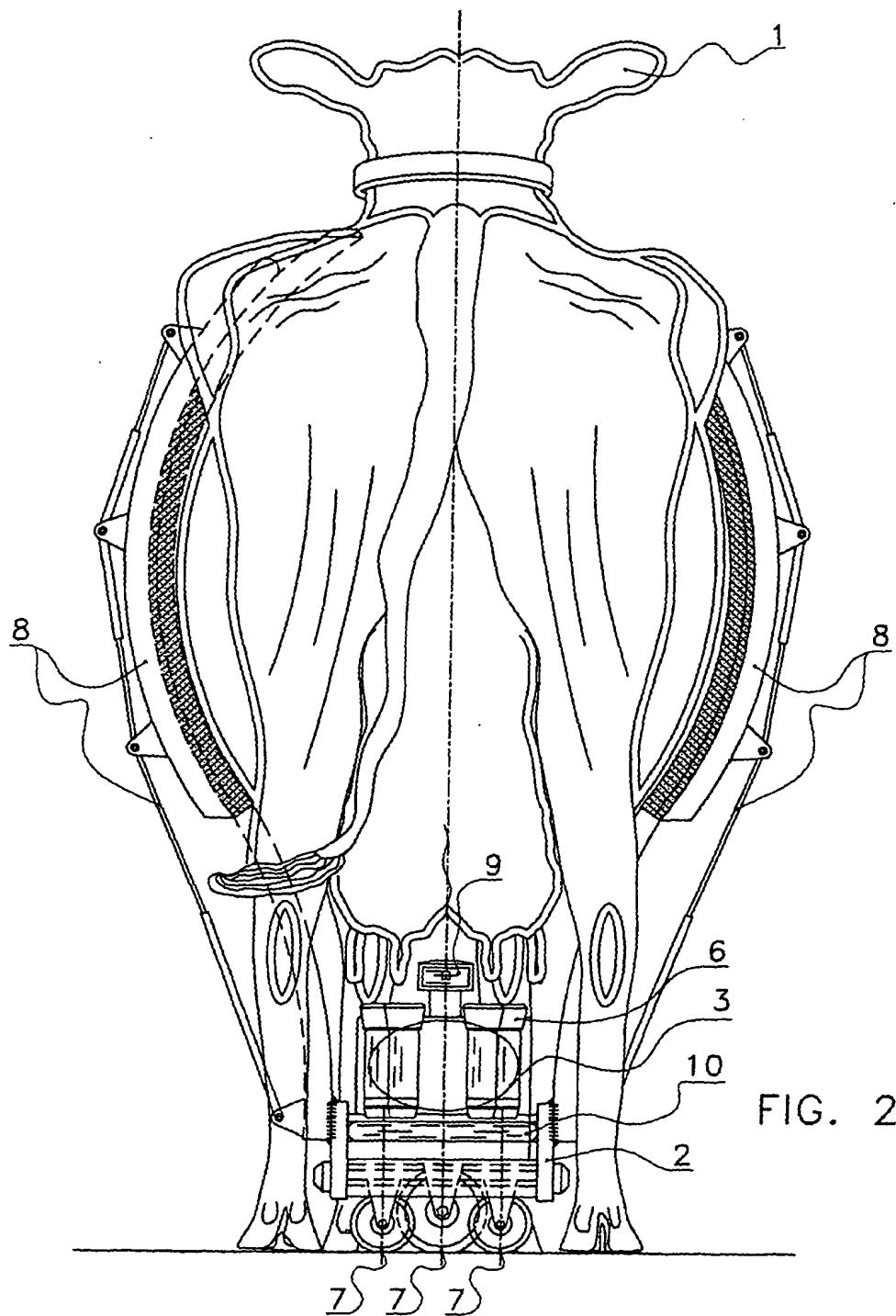
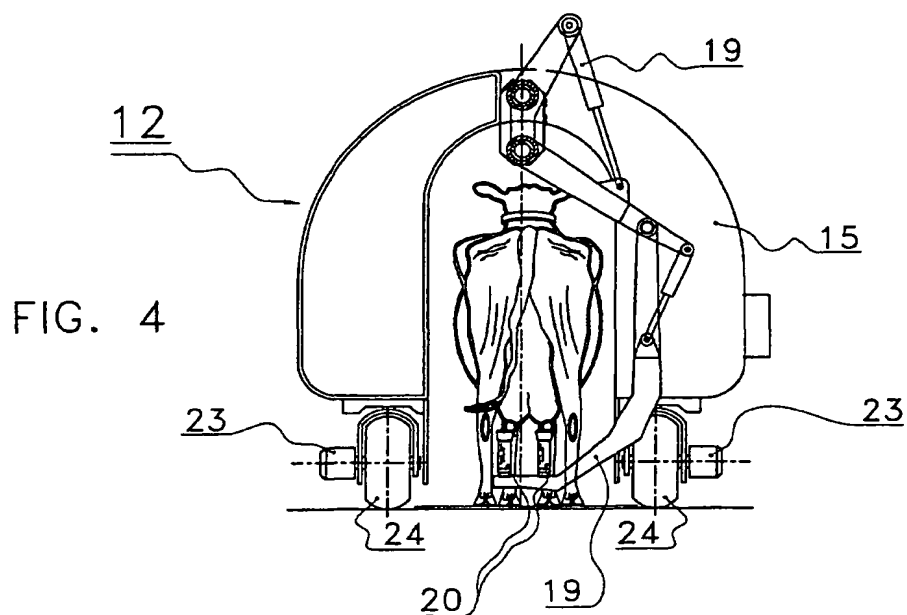
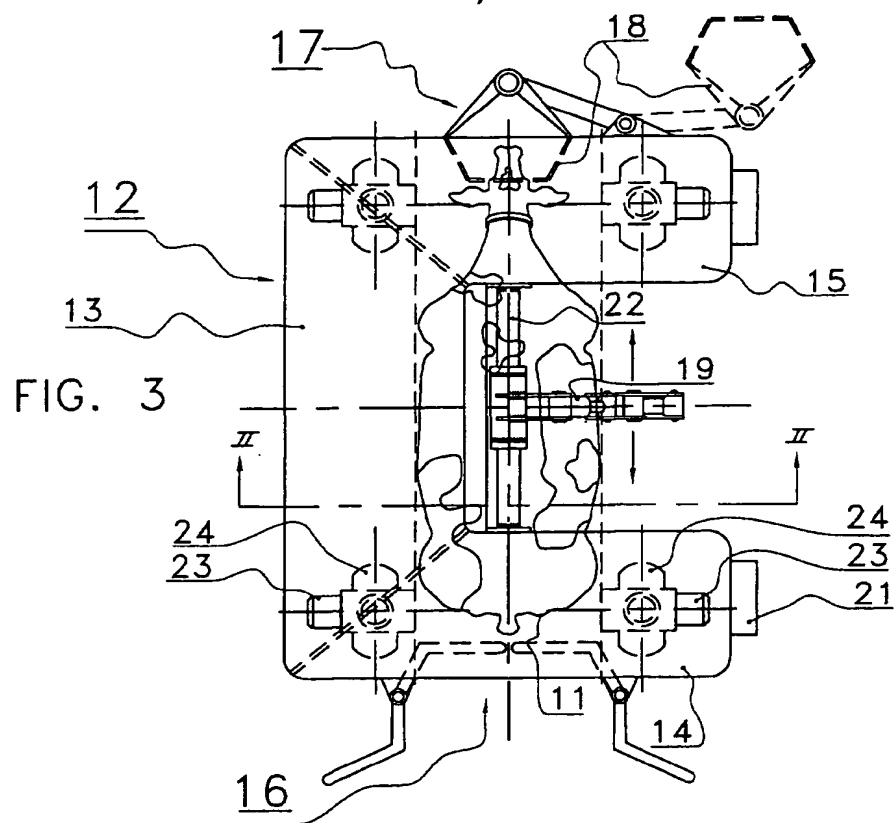
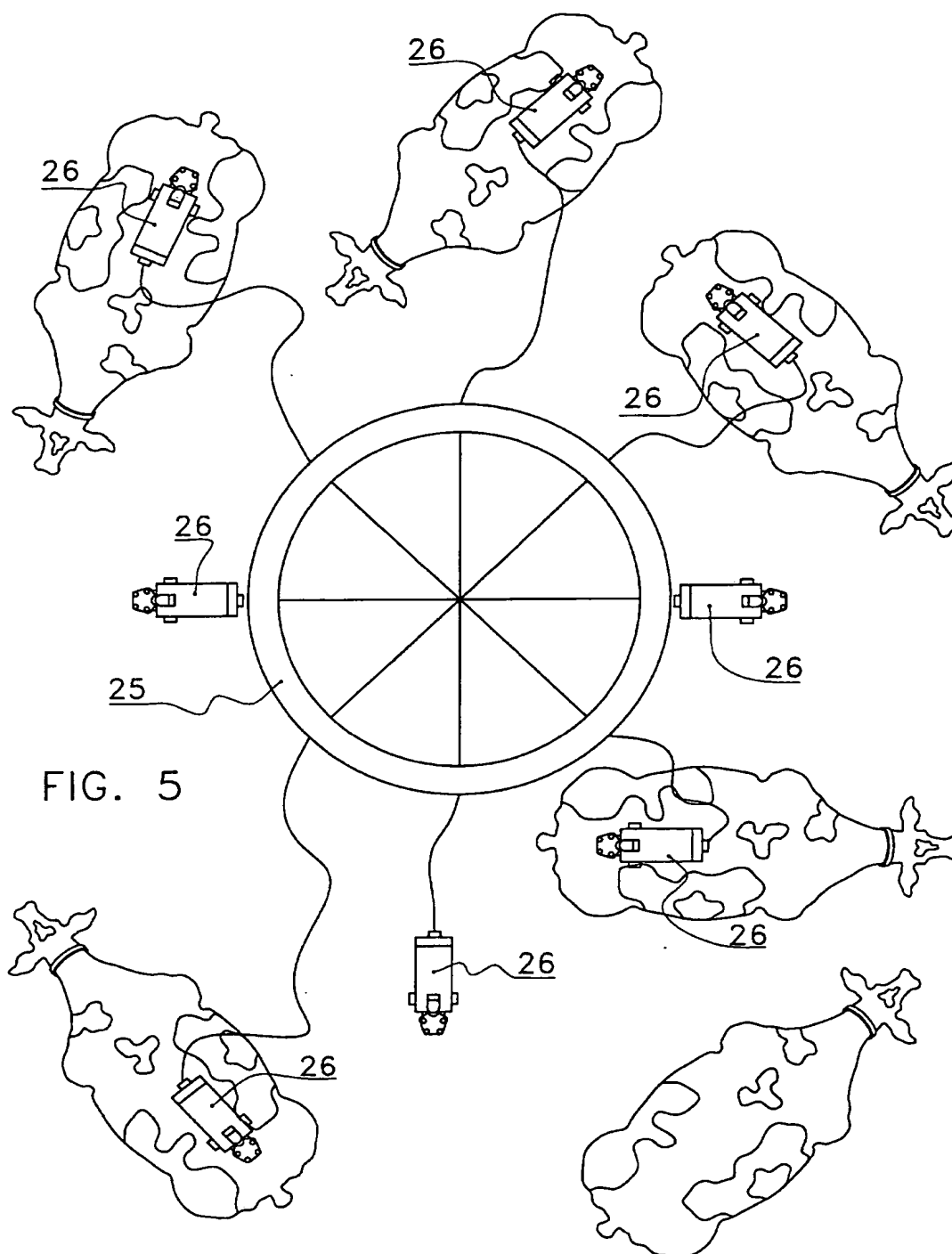


FIG. 2







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EUROPEAN SEARCH REPORT

Application Number
EP 01 20 3433

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	EP 0 635 203 A (TEXAS INDUSTRIES INC) 25 January 1995 (1995-01-25) * claims; figures *	1-11	A01J5/017
A	EP 0 951 823 A (MAASLAND NV) 27 October 1999 (1999-10-27) * claims; figures *	1	
A	FR 2 298 943 A (LAPIERRE RAYMOND) 27 August 1976 (1976-08-27) * claims; figures *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7) A01J A01K
Place of search THE HAGUE		Date of completion of the search 5 December 2001	Examiner Piriou, J-C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 20 3433

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05-12-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0635203 A	25-01-1995	NL 9301260 A	16-02-1995
		DE 69422945 D1	16-03-2000
		DE 69422945 T2	05-10-2000
		EP 0635203 A2	25-01-1995
		EP 0951823 A2	27-10-1999
EP 0951823 A	27-10-1999	NL 9301260 A	16-02-1995
		EP 0951823 A2	27-10-1999
		DE 69422945 D1	16-03-2000
		DE 69422945 T2	05-10-2000
		EP 0635203 A2	25-01-1995
FR 2298943 A	27-08-1976	FR 2298943 A1	27-08-1976

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